

("Omelis"), in view of one or more additional references. Applicants address each of the new rejections below.

Rejection of claims 1-8, 11, 16-17 and 19-22

Claims 1-8, 11, 16-17 and 19-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Omelis in view of U.S. Patent No. 5,073,294 to Shannon et al. ("Shannon"). The Examiner provided the following comments on pages 2-3 of the Office Action in support of the rejection:

Regarding claims 1, 5-6, Omelis has a polymerizable mixture comprising at least the following two components: (i) a liquid crystal monomer having cross-linkable groups (stilbene monomer I-A) and (ii) a photo-orientable monomer (azo dye monomer II-C) (column 10, lines 50-55). As seen on the next page [of the Office Action], the stilbene group is liquid crystalline (mesogenous) with the two vinylic double bonds providing the cross-linkable groups in monomer I-A (column 2, lines 60-65) and the azobenzene linking group provides the cis-trans isomerizable photo-orientable group (claim 5) for the azo dye monomer (column 6, lines 10-25) (claim 6) which is monomer II-C.

The Examiner acknowledged on page 3 of the Office Action that 1) Omelis teaches stretching to orient the liquid crystal, 2) Omelis fails to teach photo-orientation of a photo-orientable monomer, and 3) Omelis fails to teach that the photo-orientation would induce an alignment of the liquid crystal monomer. The Examiner cited Shannon, however, as teaching that liquid crystals can be oriented using linearly polarized light with the aid of an azo dye, wherein the azo dye is oriented by linearly polarized light and orients the liquid crystal in contact with it. Office Action at pages 3-4. This led the Examiner to the following conclusion:

Therefore, because Shannon demonstrates the advantages of using linearly polarized light to orient liquid crystal with the aid of an azo dye, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used linearly polarized light to photo-orient the photo-orientable azo dye monomer of Omelis, to induce an alignment of the liquid crystal monomer of Omelis, in order to provide the desired multi-orientation of the liquid crystal.

Office Action at page 4. Pages 4-5 of the Office Action then discuss the rejection of claims 2-4, 7-8, 11, 16-17, 19-22 and 24. Applicants traverse this rejection as it relates

to at least claim 1 for the reasons explained below. All other rejected claims depend from claim 1 and should be patentable for the same reasons.

Claim 1 recites a polymerizable mixture comprising (i) a liquid crystal monomer or pre-polymer having cross-linkable groups; and (ii) a photo-orientable monomer or oligomer or polymer that, when photo-oriented, induces an alignment of the liquid crystal monomer or pre-polymer. To establish a *prima facie* case of obviousness against this claim, the Examiner must show, among other things, that the references when combined teach or suggest all the claim limitations. MPEP § 2143. This requirement has not been met in this instance.

As an initial matter, claim 1 is a composition claim. The Examiner's conclusion of obviousness quoted above from page 4 of the Office Action appears to relate to a method invention, not a composition invention. See conclusions regarding the use of linearly polarized light and inducing an alignment of liquid crystal. The analysis of claim 1, however, should focus on the patentability of the claimed composition invention having the recited components.

The person skilled in the art would not have been motivated to make the composition invention of claim 1 in view of the cited documents. Omelis discloses at column 10, lines 51-56, a mixture comprising the constituents I-A, II-A and II-C. The formulas of these constituents are illustrated in column 10. The Examiner has interpreted constituent I-A as corresponding to component (i) of the invention and constituent II-C as corresponding to component (ii) of the invention. Constituent II-C in Omelis is a mono-azobenzene-dye, which is substituted with chlorine at a number of positions.

To correspond to component (ii) of the invention, constituent II-C of Omelis would need to be

(a) photo orientable, and to concomitantly

(b) be capable of inducing an orientation in the component (i) when photo-oriented.

In an attempt to show this, the Examiner makes use of the disclosure of Shannon, and makes the general statement that Shannon teaches that liquid crystals can be oriented

using linearly polarised light with the aid of an azo dye. See Shannon column 6, lines 30-40 as well as lines 55-57 and Table.

Applicants do not agree that the disclosure in Shannon teaches that constituent II-C satisfies the criteria of component (ii) of the invention. First of all, Shannon does not teach or suggest that any and all azo-dyes could be used in the context of the so-called UV- or laser-method discussed in the reference. To the contrary, it is the applicants understanding that only specific azo dyes can actually be used in the disclosed UV-method. The dyes exemplified in the Table bridging columns 5-8 of Shannon, moreover, are structurally dissimilar from the monomer II-C disclosed by Omelis. For example, the exemplified systems in the Shannon table are all **Diazo-** or **Polyazo-**dyes, i.e. very specific dyes with large, elongated conjugated structural moieties. Furthermore, the substituents as well as the substitution patterns are different in Shannon from the substitution of monomer II-C. The substituents as well as the specific substitution pattern of the azobenzene-group is, according to the applicant's understanding, key to its properties, and this is believed by the applicants to be well known for this type of dyes.

Shannon at col. 6, lines 34-38 refers to U.S. Patent No. 4,974,941 to Gibbons as a relevant disclosure for the so-called UV-method. Like Shannon, Gibbons also does not contain a teaching or suggestion that any and all imaginable azo-dyes will have the property that, if irradiated with linearly polarized light, they will adopt a certain orientation and impart that orientation onto an adjacent layer of liquid molecules.

In view of the above, the disclosure of Shannon does not serve to show that any and all azo-dyes will have the property that, if irradiated with linearly polarised light, they will adopt a certain orientation and impart that orientation onto a liquid crystal monomer or prepolymer. For at least this reason, the Examiner's reference to Shannon does not teach or suggest that constituent II-C of Omelis corresponds to component (ii) of the invention.

A combination of the teachings of the Omelis and Shannon disclosures would not appear to lead to the claimed invention for an additional reason as well. Shannon focuses on optical orientation, as opposed to orientation imposed by mechanical

treatment as in Omelis. This optical orientation by use of linearly polarised light (so-called laser alignment) is discussed in Shannon by using two possible configurations:

- One possibility is to provide a substrate containing an anisotropic absorbing material, to expose this to polarised light, and to then overcoat this orientation layer with the polymerisable mesophase.
- Another possibility is to coat a substrate with an anisotropic absorbing material, to overcoat this coated substrate with a polymerisable mesophase, and to then expose this to polarised light.

See column 7, line 51-63 and Figure 1 with individual layers; 3: orientation layer; 4: liquid-crystal layer.

In both configurations cited above, the anisotropic absorbing material is located in a layer different from the liquid-crystal layer, so the polymerisable mesophase is provided as a separate layer. There is no teaching or suggestion that the anisotropic absorbing material be mixed with the polymerisable mesophase and that the same process would be desirable or even possible using such a mixture. In view of the fact that optically induced orientation in Shannon is disclosed using separate orientation layers which are brought into contact with liquid-crystal layers, the person skilled in the art would not have considered making mixtures of components (i) and (ii) as claimed.

The Shannon disclosure conveys that if a separate layer is oriented by linearly polarised light, this will lead to a macroscopic effect which allows to impart the orientation onto a liquid-crystal system located in an individual layer provided adjacent to the oriented layer. In contrast, with respect to the mixture of components (i) and (ii) of the invention, the orientation behavior of the component which is influenced by the linearly polarised light would have been expected to differ due to the different surroundings. There is no showing in Shannon that a liquid-crystal system which is in a mixture with it can also be intrinsically oriented. The combination with Omelis with Shannon to suggest otherwise appears to be inappropriate hindsight consideration of the invention now claimed.

For the reasons explained above, claim 1 and all other claims that depend from it should be patentable in view of the cited references. To the extent that the Examiner decides to maintain this rejection, applicants respectfully request that the Examiner provide specific remarks on why, if at all, monomer II-C of Omelis should be assumed to correspond to component (ii) of the invention, where specifically in the state of the art one can find a suggestion or motivation to combine the disclosure of Shannon with Omelis or vice versa, and why such a combination should lead to the invention in view of the fact that in Shannon the orientation is disclosed as being imposed onto a liquid-crystal layer by means of a separate orientation layer.

Rejection of claims 9-10, 12-14, 18 and 24

The Examiner rejected claims 9-10, 12-14, 18 and 24 under 35 U.S.C. § 103(a) as obvious over Omelis in view Shannon and further in view of U.S. Patent No. 5,602,661 to Schadt et al. ("Schadt"). In making this rejection, the Examiner relied on Omelis and Shannon as suggesting a mixture as claimed in claim 1 and on Schadt as teaching the presence of other dichroic dyes, chiral additives, the liquid crystalline phases of the liquid crystal monomer and other features of the rejected claims. Omelis and Shannon do not suggest the mixture of claim 1 for the reasons explained above. The disclosure of Schadt does not fill the gaps missing in the Omelis and Shannon patent disclosures to render claim 1 obvious and, as a result, the claims included in this rejection would not have been obvious.

Rejection of claim 15

The Examiner rejected claim 15 under 35 U.S.C. § 103(a) as obvious over Omelis in view Shannon and further in view of U.S. Patent No. 5,589,237 to Akashi et al. ("Akashi"). In making this rejection, the Examiner relied on Omelis and Shannon as suggesting a mixture as claimed in claim 1 and on Akashi as teaching the presence of fluorescent molecules. Omelis and Shannon do not suggest the mixture of claim 1 for the reasons explained above. The disclosure of Akashi does not fill the gaps missing in the Omelis and Shannon patent disclosures to render claim 1 obvious and, as a result, the claims included in this rejection would not have been obvious.

Rejection of claims 23 and 25

The Examiner rejected claims 23 and 25 under 35 U.S.C. § 103(a) as obvious over Omelis in view Shannon and further in view of U.S. Patent No. 5,706,131 to Ichimura et al. ("Ichimura"). In making this rejection, the Examiner relied on Omelis and Shannon as suggesting a mixture as claimed in claim 1 and on Ichimura as teaching certain features of claims 23 and 25. Omelis and Shannon do not suggest the mixture of claim 1 for the reasons explained above. The disclosure of Ichimura does not fill the gaps missing in the Omelis and Shannon patent disclosures to render claim 1 obvious and, as a result, the claims included in this rejection would not have been obvious.

In view of these remarks, applicants respectfully requests reconsideration and reexamination of this application and the timely allowance of the pending claims. Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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